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Reg. No. : .....

Name : .....

**Fifth Semester B.Sc. Degree Examination, December 2022**

**First Degree Programme Under CBCSS**

**Chemistry**

**CH 1541 — PHYSICAL CHEMISTRY – I**

**(2018 & 2019 Admission)**

Time : 3 Hours

Max. Marks : 80

**SECTION – A**

Answer **all** questions in **one** word/sentence. **Each** question carries **1** mark.

1. Write Ideal gas equation.
2. Write the Gibb's free energy equation.
3. Define Isotonic solutions.
4. Define colligative property.
5. Give the relationship between  $C_p$  and  $C_v$ .
6. What is fugacity?
7. What is point group?
8. Write any two uses of liquid crystals.

P.T.O.

9. What is inversion temperature?
10. What are the physical significance of entropy?

**(10 × 1 = 10 Marks)**

### SECTION – B

Answer any **eight** questions. **Each** question carries **2** marks.

11. What is Virial Equation of State and Boyle temperature?
12. Explain Maxwell Boltzmann distribution of molecular velocities, state equation.
13. What is unit cell? Draw Unit cell of BCC.
14. What are the factors affecting surface tension?
15. State Zeroth law of thermodynamics.
16. What do you mean by isothermal and adiabatic process?
17. What are Miller indices? Calculate the miller indices of (412) plane.
18. What is Frenkel defect?
19. Define mole fraction.
20. Explain the criteria for spontaneous reaction.
21. What is plane of symmetry?
22. Explain enthalpy of neutralisation and enthalpy of combustion.
23. What is Boyle temperature?
24. Explain collision diameter.
25. Distinguish between anisotropy and isotropy.
26. What is fugacity?

**(8 × 2 = 16 Marks)**

## SECTION – C

Answer any **six** questions. **Each** question carries **4** marks.

27. Derive root mean square velocity and average velocity from Maxwell-Boltzmann equation.
28. Explain Hess's law and its applications.
29. Deduce the relationship between  $C_p$  and  $C_v$  by thermodynamics.
30. What is chemical potential and derive Gibbs Duhem equation?
31. Derive Vander Waal's equation and discuss its importance.
32. Describe the determination of viscosity by Ostwald's viscometer.
33. Explain the DSC method to characterize liquid crystals.
34. Describe the point group of  $H_2O$  and  $C_6H_6$ .
35. Explain entropy as a function of pressure and temperature.
36. Explain molarity, molality and mole fraction.
37. How surface tension is determined by stalagmometer?
38. Describe the structure of NaCl and Zinc blend.

**(6 × 4 = 24 Marks)**

## SECTION – D

Answer any **two** questions. **Each** question carries **15** marks.

39. (a) Derive Bragg's equation
- (b) The edge length of the unit cell of NaCl crystal lattice is 564 pm by X-Ray diffraction. Compute the interionic distance between sodium and chloride ions.

40. (a) Calculate  $T_c$ ,  $P_c$  and  $V_c$  for  $C_2H_2$  Given  $a = 5.340 \text{ atm litre mol}^{-2}$   
 $b = 0.0768 \text{ litre}$ .
- (b) What is meant by reversible process? Derive an expression for work done in the reversible isothermal expansion of an ideal gas.
41. Illustrate on various types of defects in crystals.
42. (a) Thermodynamically derive  $\Delta T_b = k_b \times m$ .
- (b) Construct group multiplication table for  $C_{2v}$ .
43. Derive Clausius-Clapeyron equation and explain its significance.
44. Describe different types of liquid crystals its structure and applications.

**(2 × 15 = 30 Marks)**

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